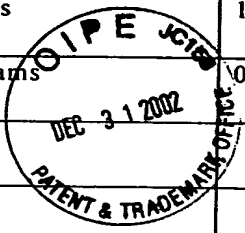


Full Name(s) of Inventor(s)	Emp. Serial	Div./Dep	Bldg. Zip	Location	Extension	FOR USE BY THE INTELLECTUAL PROPERTY LAW DEPT.
Brian Hart	0255559	509D57 A	032-3	7H3	3916	
Shauna Leis	1093712	509D57 A	032-3	7H3	5670	
Gary Williams	0121820	509CA3 L	032-3	8A2	6506	



DISCLOSURE NO.  
LE8: 0239  
Where & When Received  
(TIME STAMP)

**Title of Invention (Short and Descriptive)**

Simple Process to Promote Chip Adhesion and Prevent Grit Blast Damage

**Problem Solved by this Invention (Summary)**

- 1) Silane provides extremely high adhesion of the nozzle plate to the chip for a long period of time
- 2) Polyacrylamide provides protection from grit blast damage to the chip surface
- 3) The Silane + Polyacrylamide process can be used without a photoresist to greatly simplify and shorten processing

**NOTE:** For clearance of products by the Intellectual Property Law Department, it is imperative that the respective attorney be made aware of any product association with this invention disclosure and the announce/release date.

- (1) If this invention is slated for incorporation into a SPECIFIC product, please indicate the product code name: \_\_\_\_\_  
Please indicate the scheduled announce or release date: \_\_\_\_\_

- (2) If this invention **IS NOT** slated for incorporation into a product, please so indicate by writing "none". None yet.

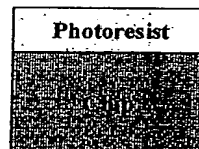
**THIS DISCLOSURE WILL NOT BE PROCESSED BY THE IP LAW DEPARTMENT  
UNTIL THE ABOVE PRODUCT INFORMATION IS COMPLETED**

**INVENTION BACKGROUND**

Grit blasting is commonly used to cut an ink flow channel through the back side of a silicon heater chip. Some of the grit passing through the wafer may ricochet and impinge on the device side of the wafer, causing electrical shorts and open circuits. Deposition of a permanent photoresist layer (0a) before grit blast (0b) provides substantial protection against grit impingement. It also planarizes the surface and chemically improves the adhesion between polymer nozzle plate and chip surface.

However, some grit may penetrate the photoresist. Use of a thicker photoresist will help, but that requires greater imaging precision and may be less forgiving of process variations. Also, the photoresist does not cover 100% of the wafer surface, leaving the heater and often other circuitry completely unprotected.

0a



0b



**Witnesses:** The two witnesses whose signatures appear below have read and understand this entire invention disclosure.

Signature of Witness \_\_\_\_\_ Date \_\_\_\_\_

Signature of Witness \_\_\_\_\_ Date \_\_\_\_\_

**DISCLOSURE SUBMITTED BY**

Inventor's Signature Brian Hart Date \_\_\_\_\_

Inventor's Signature Shauna M. Leis Date \_\_\_\_\_

Inventor's Signature Gary Williams Date \_\_\_\_\_

Inventor's Signature \_\_\_\_\_ Date \_\_\_\_\_

Inventor's Signature \_\_\_\_\_ Date \_\_\_\_\_

Inventor's Signature \_\_\_\_\_ Date \_\_\_\_\_

Adhesion of the photoresist to chip or nozzle plate can seriously degrade through long-term exposure to ink. Adhesion is most important in the areas surrounding the ink flow channels so that the correct volume of ink is ejected and ink is prevented from contacting and corroding the chip circuitry outside the ink flow path.

#### INVENTION DESCRIPTION

Differences in wafer topography, materials, and product requirements have resulted in the development of several processes to meet varying needs.

The preferred process (process 1 on last page) improves both adhesion and grit-blast resistance while simplifying and shortening the overall process, since no photoresist is used. A silane solution is spun onto the wafer (1a) and solvent dried on a hotplate or in an oven if needed. Next, a thick, aqueous polyacrylamide solution is spun on the entire wafer (1b) and dried if needed. The wafer is then grit-blasted (1c) and washed normally (1d). The water soluble polyacrylamide is completely washed off during the existing washing step. The nozzle plate is then attached using the standard process. Adhesion of the nozzle plate to chip using the silane has been better than using photoresists on certain products. Ninety degree peel test results and visual inspections of ink channels have shown better bulk and nozzle area adhesion even after accelerated ink soak tests.

Several variations are possible on products that require the photoresist. If the photoresist is thick enough, the polyacrylamide layer may be skipped (see process 2). The silane layer is spin-coated (2a). The photoresist is applied (2b). The wafer is grit-blasted (2c) and washed (2d). The final step removes the surface grit but does not remove any bulk layers. However, large grit particles that are partially embedded in the unprotected photoresist during grit blast may be pushed through the photoresist to damage the chip during nozzle plate attachment. Process 3 includes coating silane (3a), photoresist (3b), and polyacrylamide (3c) layers before grit-blasting (3d) and washing (3e). Process 4 can be used if photoresist to chip adhesion remains sufficiently high over the product lifetime, alleviating the need to deposit the initial silane coat. The photoresist is applied (4a) followed by polyacrylamide (4b). The wafer is then grit-blasted (4c) and washed (4d). In processes 3 and 4 the polyacrylamide provides a first layer of protection for the heaters and a second layer of protection over the photoresist regions. In addition, the polyacrylamide completely washes off of the photoresist during the existing wash step, so large grit particles that become embedded in the polyacrylamide are removed and do not get pressed into the chip during nozzle plate attachment.

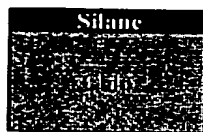
**Witnesses:** The two witnesses whose signatures appear below have read and understand this entire invention disclosure.

Signature of Witness	Date
<i>Isabel</i>	
Signature of Witness	Date
<i>Colin Maher</i>	

#### DISCLOSURE SUBMITTED BY

Inventor's Signature	Date
<i>Bill Hart</i>	
Inventor's Signature	Date
<i>Shauna M. Lewis</i>	
Inventor's Signature	Date
<i>Darryl Williams</i>	
Inventor's Signature	Date
Inventor's Signature	Date
Inventor's Signature	Date

1a



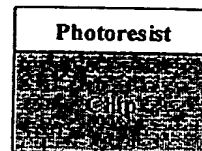
2a



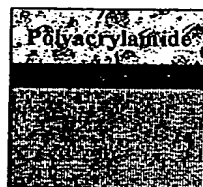
3a



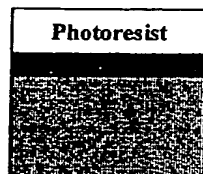
4a



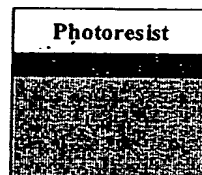
1b



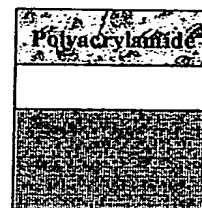
2b



3b



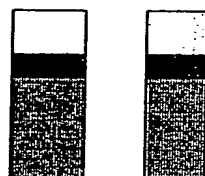
4b



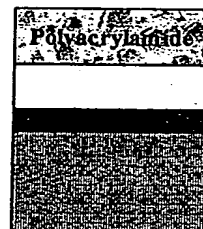
1c



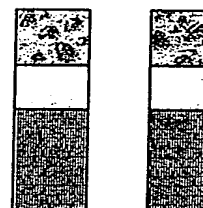
2c



3c



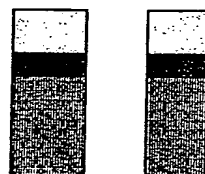
4c



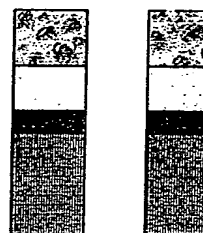
1d



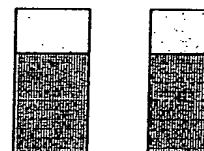
2d



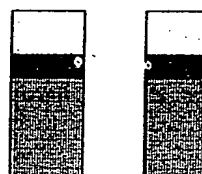
3d



4d



3e



**Witnesses:** The two witnesses whose signatures appear below have read and understand this entire invention disclosure.

Signature of Witness

*P. Spatil*

Date

Signature of Witness

*Colin M. Mues*

Date

**DISCLOSURE SUBMITTED BY**

Inventor's Signature

*Bin Hunt*

Date

Inventor's Signature

*Shauna M. Feis*

Date

Inventor's Signature

*Darryl Williams*

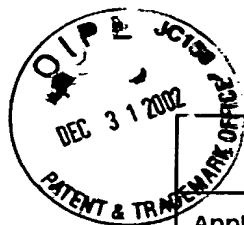
Date

Inventor's Signature

Date

Inventor's Signature

Date



1763

# AMENDMENT TRANSMITTAL LETTER

LNG form

Docket No. (56202.US/4665.0)  
2001-0128.00

Application No.  
09/929,849

Filing Date  
08-14-2001

Examiner  
Roberts P. Culbert

Group Art Unit  
1763

Invention Title METHOD FOR MAKING INKJET PRINTHEADS

## TO THE ASSISTANT COMMISSIONER FOR PATENTS

Transmitted herewith is an amendment in the above-identified application.

- ☐ Small Entity status of this application has been established under 37 CFR 1.27 by a verified statement previously submitted.
- ☐ A verified statement to establish Small Entity status under 37 CFR 1.27 is enclosed.
- ☒ No additional fee is required.
- ☒ The fee has been calculated as shown below:

### CLAIMS AS AMENDED

(1) (2) (3)

	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT NUMBER EXTRA	RATE	FEE
TOTAL CLAIMS	* 18	minus	** 18	0	x \$18	\$ 0
INDEPENDENT CLAIMS	* 2	minus	*** 2	0	x \$84	0
MULT. DEPENDENT CLAIM ADDED					\$280	0
					<b>TOTAL</b>	<b>\$ 0</b>
If applicant has small entity status under 37 CFR 1.9 and 1.27, then divide total fee by 2, and enter amount here.					<b>SMALL ENTITY TOTAL</b>	<b>\$ 0</b>

\* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.  
\*\* If the highest number previously paid for IN THIS SPACE is less than 20, enter "20".  
\*\*\* If the highest number previously paid for IN THIS SPACE is less than 3, enter "3".  
The "highest number previously paid for" (total or independent) is the highest number found in the appropriate box in column 1.

- ☐ Please charge Deposit Account No. 12-2355 in the amount of \$ \_\_\_\_\_. A duplicate copy of this sheet is enclosed.
- ☐ A check in the amount of \$ to cover the filing fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 12-2355. **A duplicate copy of this sheet is enclosed.**
- ☒ Any additional filing fees required under 37 CFR 1.16.
- ☒ Any patent application processing fees under 37 CFR 1.17.

David E. LaRose, Reg. No. 34,369

Form LNG (9/96)

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### \*\*\* CERTIFICATE OF MAILING \*\*\*

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Box NON FEE Amendment, Assistant Commissioner for Patents, Washington, D.C. 20231.

on December 26, 2002  
Date

David E. LaRose, Reg. No. 34,369



Serial No. 09/929,849  
Docket No. 2001-0128.00  
(56202.US/4665.0)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Brian C. Hart et al.  
Application No.: 09/929,849  
Filing Date: August 14, 2001  
Confirmation No.: 9848  
Title: METHOD FOR MAKING INKJET PRINTHEADS  
Examiner: R. P. Culbert  
Group Art Unit: 1763

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AMENDMENT A

BOX NON-FEE AMENDMENT  
Honorable Commissioner for Patents  
Washington, D.C. 20231

Sir:

In response to the Office Action dated October 29, 2002, please amend the above-referenced application as follows:

IN THE CLAIMS:

Please cancel Claims 1 and 12 in their entirety without prejudice or disclaimer.

Claim 2 (amended). The method of Claim 19 wherein the protective material comprises a water-soluble polyacrylamide.

Claim 3. (amended) The method of Claim 19 wherein the protective material is derived from a polyacrylamide material and the protective material is applied to a silane adhesion promoter layer as the first layer.